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U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

34052

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

10/009133

INTERNATIONAL APPLICATION NO.

PCT/FR00/01049

INTERNATIONAL FILING DATE

20 April 2000

PRIORITY DATE CLAIMED

23 April 1999

TITLE OF INVENTION INSTALLATION FOR MAKING A NONWOVEN TEXTILE WEB AND METHOD FOR
USING SUCH AN INSTALLATION

APPLICANT(S) FOR DO/EO/US

DUBUS, Jean-Michel; DAMASCO, Bruno; MAGGIO, Rosario

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☒ is attached hereto.
 - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
14. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☐ Other items or information:

page 1 of 2

Express Mail No. EL609746604US

I hereby certify that this correspondence is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10, and is addressed to: Assistant Commissioner for Patents, Washington D.C. 20231 on the date indicated below.

Debra A. Peterlin

Name of Person Mailing Correspondence

10/22/2001

Date

Signature of Person

Mailing Correspondence

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| U.S. APPLICATION NO. 10/009133 | | INTERNATIONAL APPLICATION NO. PCT/FR00/01049 | | ATTORNEY'S DOCKET NUMBER 34052 | |
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|---|--------------|--------------|---|---------------------------|----|
| 21. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO..... \$1040.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$890.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$740.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$710.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00 ENTER APPROPRIATE BASIC FEE AMOUNT = | | | CALCULATIONS PTO USE ONLY <div style="border: 1px solid black; padding: 5px; width: 100%;"> 890.00 </div> | | |
| Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)). | | | \$ 130.00 | | |
| CLAIMS | NUMBER FILED | NUMBER EXTRA | RATE | \$ | |
| Total claims | - 20 = | | x \$18.00 | \$ | |
| Independent claims | - 3 = | | x \$84.00 | \$ | |
| MULTIPLE DEPENDENT CLAIM(S) (if applicable) | | | + \$280.00 | \$ | |
| TOTAL OF ABOVE CALCULATIONS = | | | | \$ | |
| <input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2. | | | | + | |
| SUBTOTAL = | | | | \$ 1020.00 | |
| Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)). | | | | \$ | |
| TOTAL NATIONAL FEE = | | | | \$ 1020.00 | |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property + | | | | \$ | |
| TOTAL FEES ENCLOSED = | | | | \$ 1020.00 | |
| | | | | Amount to be refunded: | \$ |
| | | | | charged: | \$ |

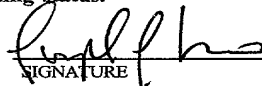
a. ☒ A check in the amount of \$ 1,020.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
 A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any
 overpayment to Deposit Account No. 16-0820. A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card
 information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR
 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

| | |
|---|---|
| SEND ALL CORRESPONDENCE TO: Joseph J. Corso, Esq. Pearne & Gordon LLP 526 Superior Avenue East Suite 1200 Cleveland, Ohio 44114-1484 |  _____ SIGNATURE Joseph J. Corso _____ NAME 25845 _____ REGISTRATION NUMBER |
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10005133 013902

PATENTIN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Jean-Michel Dubus et al.
Title: INSTALLATION FOR MAKING A NONWOVEN
TEXTILE WEB AND METHOD FOR USING SUCH
AN INSTALLATION
Docket No.: 34052

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to the examination of the above-identified
patent application, it is requested that the following
amendments be made.

IN THE CLAIMS:

Please cancel claims 1 - 8 without prejudice.

Please add the following claims 9 - 16.

- 1 9. (new) Installation for making a nonwoven textile
- 2 web comprising:
- 3 - extruding means comprising at least one extruder
- 4 for feeding a melted organic polymer to a spinneret for
- 5 producing a curtain of filaments, cooling means including
- 6 a cooling zone for providing at least surface
- 7 solidification of said filaments, a filament-drawing
- 8 assembly including a suction device comprising a narrow
- 9 chamber of rectangular cross-section in which said
- 10 curtain of filaments is drawn by high-speed air streams,

11 said chamber having a chamber outlet for emitting drawn
12 filaments, distributing means for deflecting and slowing
13 air streams at the chamber outlet and for distributing
14 the filaments homogeneously over a receiving belt, said
15 extruding means, cooling means, filament-drawing assembly
16 and distributing means being separately controllable and
17 independently adjusted during start-up and continuous
18 operation.

1 10. (new) Installation according to claim 9, in
2 which the cooling means and the filament-drawing assembly
3 each comprise a plurality of elementary modules placed
4 side by side, the distributing means extending along the
5 entire width of the web produced.

1 11. (new) Installation according to claim 9, in
2 which the cooling zone comprises an assembly having a
3 plurality of successive zones for subjecting the curtain
4 of filaments to a transverse air current, the speed and
5 temperature of which may be adjusted independently in
6 each of the zones.

1 12. (new) Installation according to claim 9, in
2 which the suction device has a suction slot, the width of
3 which may be adjusted automatically according to the
4 production of the machine.

1 13. (new) Installation according to claim 9, in
2 which the distributing means is spaced from the filament
3 drawing assembly and comprises an assembly which
4 laterally deflects the air flow, reducing the speed
5 thereof and that of the filaments, and facilitating the
6 uniform deposition on the receiving belt by eliminating
7 any rebound at the moment of this deposition.

1 14. (new) Installation according to claim 13, in
2 which the distributing means is associated with an
3 assembly which electrostatically charges the said
4 filaments before deposition on the receiving belt.

1 15. (new) Installation according to claim 9,
2 further including computer means for controlling the
3 extruder means, the cooling means, the filament-drawing
4 assembly and the distributing means, making it possible
5 to bring about the increase in speed of the production
6 line automatically.

1 16. (new) Method for using an installation
2 according to claim 3, in which:
3 - during the start-up phase, the temperature of
4 the air inside each successive zone decreases
5 from one zone to the next, it being possible

6 for the speed of the traversing air in each
7 zone to be adjusted and to be between 0.5
8 m/second and 3 m/second in each of the said
9 zones;

10 - the production speed is then increased
11 progressively, the parameters of the cooling
12 zone for cooling and heating up the filaments
13 being modified in order to:

- 14 • increase the air speed in a first
15 successive zone, the temperature remaining
16 unchanged,
- 17 • increase the temperature in a second
18 successive zone to bring it to the level
19 of that of the first zone and increase the
20 air speed in this zone,
- 21 • increase the air temperature in a third
22 successive zone and increase the air speed
23 in this zone,

24 - simultaneously, the width of the drawing slot
25 is progressively reduced to attain a nominal
26 operating value, the pressure of the drawing
27 air being progressively increased.

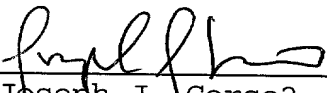
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REMARKS

Attached hereto is a page entitled "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

If there are any further fees required by this amendment not covered by an enclosed check, or if no check is enclosed, please charge the same to Deposit Account No. 16-0820, Order No. 34052.

Respectfully submitted,

By: 
Joseph J. Corso2, Reg. No. 25845

526 Superior Avenue East
Suite 1200
Cleveland, Ohio 44114-1484
(216) 579-1700

October 22, 2001

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 1 - 8 have been cancelled.

Claims 9 - 16 have been added and, therefore, no marked-up version is required.

INSTALLATION FOR MAKING A NONWOVEN TEXTILE WEB AND METHOD
FOR USING SUCH AN INSTALLATION

Technical field

- 5 The present invention relates to an improved installation for making a nonwoven textile web, which is commonly referred to by the generic name of spunbond and which is formed by continuous synthetic filaments.
- 10 It also concerns a method for using such an installation.

Prior art

- 15 The production of nonwoven webs of the spunbond type goes back decades and consist, generally speaking:
- in extruding a melted organic polymer through a spinneret perforated with holes, so as to form a bundle or curtain of filaments;
 - then, in orienting the extruded filaments by drawing by means of one or more fluid-jet, in particular compressed-air, devices,
 - and finally, in receiving the bundle of filaments in the form of a web on a movable transporting belt, which is generally subjected to a suction source and the speed of which is adjusted according to the characteristics of the web, in particular weight per unit area, which it is desired to achieve.
- 20
- 25
- 30 After production, the web is consolidated, for example by performing a sizing or calendering, preferably hot calendering, so that the elementary filaments are joined to one another.
- 35 Other consolidation treatments may also be performed, such as for example a needling treatment (conventional or by fluid jets), and/or the deposition of a bonding substance on the surface or in the interior of the web.

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A great number of proposals have been made for producing such webs, all having the aim of obtaining a web or sheet as homogeneous as possible with a high productivity and, increasingly, with elementary filaments of great fineness having a count less than 2 dtex if possible.

Among the oldest documents for producing such webs, mention may be made of the patent GB-A-932 482, in which the filaments, after extrusion, move along in the open air on leaving the spinneret over a sufficient distance to permit at least surface solidification of the said extruded filaments before they are introduced into a suction and drawing nozzle creating the formation of a high-speed annular air current.

To bring about the break-up of the bundle of filaments, the latter receive an electrostatic charge which may be obtained from an electrostatic generator causing a corona-type effect located upstream and downstream of the suction nozzle.

Among the various parameters which must be taken into account for the production of good-quality webs, it is necessary, depending on the extruded polymers, to adapt the distance between the outlet of the spinneret and the inlet into the drawing system, the air speed inside the nozzle and also the exit speed of the filaments from the latter, so that the deposition on the receiving belt is regular.

To solve this problem of the homogeneity of the deposition on the conveyor belt, it has been proposed in the patent US-A-3 286 896 to design the suction device in the form of a narrow chamber of rectangular cross-section and of great length, such an assembly comprising at the inlet a suction chamber for the extruded filaments, followed by an additional chamber where low-pressure air is

injected and a channel of great length, inside which the high-speed air flows. In order to obtain a good distribution of the filaments over the receiving surface, a deflecting assembly which slows down the air flow is
5 arranged at the outlet of the drawing chamber, thus permitting a better distribution of the filaments.

Such systems in which the filaments pass inside a suction and drawing chamber of rectangular shape, which
10 may, where appropriate, have the width of the web of extruded filaments, have been proposed, as emerges in particular from the French patent 2 064 087 (corresponding to US-A-3 802 817), the curtain of filaments being
15 subjected on both of its sides to the action of high-speed air streams causing the filaments to be drawn.

Furthermore, the patent US-A-4 064 605 describes an improvement to such a technique which consists in providing an additional assembly for cooling the filaments, before
20 introduction into the actual drawing chamber, by subjecting the bundle of filaments to a transverse air current.

Finally, the development of the technique has led to the production of installations in which the drawing of the
25 filaments at the spinneret outlet and their transfer to a receiving belt are achieved without the filaments ever going into the open air at the spinneret outlet by virtue of an integrated assembly making it possible to achieve the cooling, drawing and deposition of the filaments on the
30 belt, as emerges in particular from the patent US 4 627 811 and also US 5 814 349.

Such an installation design makes it possible to obtain nonwoven sheets with a low weight per unit area and
35 good regularity, but it is complex and difficult to use.

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Moreover, such installations lack versatility owing to the fact that it is not possible to readily adjust the cooling conditions at the spinneret outlet which vary according to the polymers and the filament count which it is desired to produce and the final characteristics of the web.

In addition, such installations are ill-suited to the production of filaments of great fineness.

Consequently, to date, no satisfactory solution has been proposed for designing an installation for producing nonwovens of the spunbond type with which it is possible to achieve a high productivity when the filaments are fine, that is to say having a count less than 2 dtex, which means having a perfect and extremely regular drawing of the filaments without breakage thereof during this drawing phase.

Now, to achieve a high productivity, that is to say a high polymer delivery at the spinneret outlet, this means on the one hand that increasing the drawing speed in the drawing slot, thus entailing a high air flow rate coupled with a relatively high temperature of the filaments before drawing in order to preserve a certain plasticity thereof.

Furthermore, a drawing of the filaments coupled with a high productivity also means being able to brake the air streams at the outlet of the drawing slot to achieve a regular deposition of the filaments on the receiving conveyor and the production of a high-quality sheet.

Summary of the invention

Now, there has been found, and this forms the subject of the invention, a novel type of installation for producing nonwoven textile webs from continuous synthetic

filaments, with which all the above-mentioned problems can be solved.

Generally speaking, the installation according to the invention is of the type comprising, in a conventional manner:

- at least one extruder for a melted organic polymer feeding a spinneret for producing a curtain of filaments;
- 10 - a cooling zone for bringing about at least surface solidification of the said extruded filaments;
- a suction device in the form of a narrow chamber of rectangular cross-section, inside which the
- 15 curtain of filaments is subjected to the action of high-speed air streams causing the filaments to be drawn;
- means for deflecting and slowing down the air flow at the outlet of the drawing slot and for
- 20 distributing the filaments homogeneously over a receiving belt.

The installation according to the invention is characterised in that the means for carrying out the

25 different operational phases, namely extruding means, cooling means, filament-drawing assembly and distributing means, are separate from one another and can be independently adjusted, not only according to the production to be achieved (nature of the polymers,

30 elementary count of the filaments produced, weight per unit area of the web produced), but also during the start-up phase of the production.

By virtue of such a design, which goes against the

35 technical development in this field, directed towards producing completely integrated assemblies for the cooling, drawing and distribution of the filaments over the conveyor

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belt, it was found that such a separation of the different operational phases from one another afforded a very great number of advantages, in particular as regards the flexibility of use and the possibility of adjusting the production much more easily according to the yarn counts and the web weight which it is desired to achieve.

Advantageously and in practice, according to the invention:

- 10 - the cooling zone at the spinneret outlet and the filament-drawing zone consist of a plurality of elementary modules placed side by side according to the production width, the filament-opening system consisting, for its part, of an assembly
- 15 extending over the entire width of the web produced;
- the cooling at the spinneret outlet is brought about by means of an assembly having a plurality of successive zones for subjecting the curtain of
- 20 filaments to a transverse air current, the speed and temperature of which may be adjusted independently in each of the zones;
- the filament-drawing device has a suction slot, the width of which may be adjusted automatically
- 25 according to the production of the machine;
- the filament-opening system, which is spaced from the outlet of the drawing system, consists of an assembly which laterally deflects the air flow, reducing the speed thereof and that of the
- 30 filaments, and facilitating the uniform deposition on the conveyor by eliminating any rebound at the moment of this deposition;
- advantageously the filament-opening system is also associated with an assembly which
- 35 electrostatically charges the said filaments before deposition on the receiving belt and which may be arranged either immediately at the outlet

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of the said opening system or integrated inside the latter;

- the installation has means for controlling, by computer, all of the subassemblies making it possible to bring about the increase in speed of the production line automatically.

The invention also relates to a method for using such an installation, which method is characterised in that:

- during the start-up phase, the temperature of the air inside each cooling zone decreases from one zone to the next, it being possible for the speed of the traversing air in each zone to be adjusted and to be between 0.5 m/second and 3 m/second in each of the said zones, the drawing slot being maintained in the separated position,
- the production speed is then increased progressively, the parameters of the zone for cooling and heating up the filaments being modified in order to:
 - . increase the air speed in the first zone, the temperature remaining unchanged,
 - . increase the temperature in the second zone to bring it to the level of that of the first zone and increase the air speed in this zone,
 - . increase the air temperature in the third zone and increase the air speed in this zone;
- simultaneously, the width of the drawing slot is progressively reduced to attain a nominal operating value, the pressure of the drawing air being progressively increased.

It should be noted that in the method according to the invention, the air temperature inside each cooling zone is generally in a range extending from 5°C to 60°C.

35 Brief description of the drawings

The invention and the advantages which result therefrom will be better understood thanks to the following

each of the zones decreases from the first zone (4a) to the third zone (4c).

The temperature of the air in this zone will generally be between 15 and 60°C, the speed of the traversing air for its part being between 0.5 m/s and 3 m/s.

Downstream of this cooling zone is arranged the actual drawing assembly (5), which is in the form of a closed enclosure having a slot (6) into which air is injected under a pressure of 0.5 to 1.5 bar.

Generally speaking, such a drawing system may be designed in a manner similar to the teachings of FR 1 582 147 or GB 932 482 (Figure 3), with which it is possible to bring about the suction of the curtain of filaments and its entrainment by high-speed air streams enabling drawing to be performed.

As can be seen from Figure 3, in which such a drawing assembly (5) is represented schematically, the latter is composed essentially of an actual drawing slot (10), the air coming from a collector (11) being introduced into this chamber (10) through a distributor (12) and an accelerating chamber (13).

Such a suction/drawing assembly is, however, preferably designed so that the width (F) of the slot (10) can be modified during the operation of the installation, which makes it possible on the one hand to adjust the flow rate of the air streams and, consequently, the fineness of the count which it is desired to achieve and on the other hand facilitates the start-up operation as will be seen hereinbelow.

In general, for a production of filaments having a count of between 1.5 dtx and 3 dtx, the width (F) of the

slot will be between 3 mm and 10 mm, it being possible to increase this slot gap to 25 mm during the start-up phase.

At the outlet of the drawing assembly (5), the bundle
5 of filaments (3) is projected onto the receiving belt (7)
not directly as emerges from FR 2 064 087 or US 4 064 605,
but through an assembly (6) causing the air jet leaving the
slot (5) to be deflected and slowed down, leading to the
opening of the curtain of filaments and the distribution of
10 these filaments over the receiving belt (7).

Such an assembly may, for example, be in the form of a
slot with divergent walls.

15 Furthermore, to intensify the break-up of the curtain
of filaments and the random distribution over the receiving
surface, these filaments may be electrostatically charged
by means of a system of the "corona" type which is
associated with the distributing element (6), in a manner
20 similar to the teachings of British patent 932 482.

Where appropriate, the means for electrostatically
charging the filaments may be integrated in the inlet of
the divergent walls of the distributor (6).
25

Exemplary embodiment

On an installation of the type illustrated by the
attached figures, a nonwoven web consisting of continuous
filaments is produced from polypropylene, in the present
30 case 38 MSR. The polymer is melted in an extruder with five
melting zones and at the outlet of the extruder, it is
filtered on a filter composed of stainless steel mesh
before being introduced into the actual spinneret (2).

35 To do this, the machine has two spinnerets (1)
arranged in series, each containing 5000 holes of 0.5 mm
diameter per metre of width.

Furthermore, according to the invention, the cooling zone (4) and the drawing zone (5) preferably consist of a plurality of elementary modules each having a width of 50 cm.

5

On the other hand, the distributing element (6) arranged at the outlet of the drawing zone (5) has, for its part, a continuous slot extending over the entire width of the installation and having the form of a divergent nozzle, the width of which is 15 mm opposite the zone in which the filaments leave the slot (5) and 100 mm opposite the receiving belt (7).

The distributing assembly (6) may, where appropriate, be associated with additional means for also electrostatically charging the filaments, thus improving the break-up of the bundle and the distribution of these filaments over the receiving belt (7).

The line is started up at low production with a polymer delivery set at 0.2 g/min and per hole.

During this start-up phase, the following parameters are observed in the heating-up zone, by using a cooling zone (4) comprising three successive zones (4a, 4b, 4c) having a total length of about 1200 mm in the course of which the extruded bundle of filaments (3) is subjected to a traversing air current coming from each of these zones, in the following conditions:

30

- zone (4a)
 - . air temperature: 35°C
 - . air speed: 1 m/second
- zone (4b)
 - . air temperature: 20°C
 - . air speed: 1 m/second
- zone (4c)

35

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- . air temperature: 15°C
- . air speed: 0.5 m/second.

During this start-up cooling phase, the width (F) of
 5 the drawing slot (5) is set at 25 mm, the pressure of the
 air injected into the said slot being 0.3 bar.

The drawn bundle passes, at the outlet of the drawing
 slot (5), into the system (6) for the opening and
 10 distribution of the said bundle which is in the form of a
 divergent nozzle, having a width at the inlet of 20 mm and
 an opening at the base of the order of 100 mm.

Throughout this start-up period, the polymer is
 15 collected on a conveyor belt (7) by means of a "leader"
 which is unrolled over the belt and which avoids the
 clogging thereof by the drops of melted polymer.

When a uniform polymer delivery is established in the
 20 spinneret, the production speed of the line is increased
 progressively.

Throughout this period of increasing speed, the
 parameters of the zone (4) for cooling and heating up the
 25 filaments are progressively modified, namely:

- increase in the air speed in the first zone (4a)
 to 1.5 metres/second, the temperature remaining
 unchanged;
- 30 - increase in the air temperature in the second
 zone (4b) which is raised to 30°C, its speed
 being raised to 1.3 metres/second;
- increase in the air temperature in the third zone
 (4c) to 20°C and increase in the speed which is
 raised to 1 metre/second.

35 Such a procedure makes it possible to ensure at least
 surface solidification of the extruded filaments, which do

not stick to one another as they enter the drawing slot (5).

With regard to this drawing slot (5), throughout the start-up period, its width is progressively reduced from 25 mm to 5 mm and, simultaneously, the pressure of the drawing air is progressively increased from 0.3 to 1 bar approximately.

The temperature of the drawing air is controlled and remains constant throughout this period.

By virtue of such a procedure, it is possible to produce, from an installation in which the different zones remain fixed relative to one another, polymers of different nature and also to facilitate the production of filaments having a very fine count of the order of 1.7 dtex, or even less.

This is so because progressively raising the temperature of the air used in the last two cooling zones (4b) and (4c) makes it possible to increase the plasticity of the polymer and thus facilitates the drawing thereof, allowing greater fineness of the filaments.

Finally, the fact of being able to adjust, while in operation, both the pressure of the drawing air and the width of the drawing slot makes it possible to optimise the drawing conditions, which, of course, results in the achievement of a high production combined with the production of very fine filaments.

The structure of the filament-opening system, arranged downstream of the drawing system and independent thereof, also promotes regular and homogeneous deposition of the filaments on the receiving surface (7).

This is so because, with the production of filaments with very fine counts being accompanied by a high speed, of the order of 5000 m/min, of the filaments at the outlet of the drawing slot, the device (6) used in the installation according to the invention makes it possible to slow down the speed of the said filaments and also of the air flow leaving the drawing slot, promoting their distribution over the conveyor belt owing to the fact that it eliminates rebound phenomena liable to disrupt regular and homogeneous deposition.

All of the adjustments of the unit are performed and controlled automatically by a process computer which operates on the so-called "fuzzy logic" principle allowing a multitude of independent parameters to be taken into account.

The concrete example given above makes it possible to obtain filaments having a count of 1.7 dtex with a polymer delivery of 0.65 g/hole/minute.

The sheets obtained can weigh from 10 to 150 g/m², are very regular, and may be used for various applications such as hygiene products (nappies for babies), and products for medical or industrial use.

While such an installation makes it possible to obtain filaments with very fine counts, it is also possible of course to markedly increase the production of the line when the filament count is increased.

By way of guidance, if in the above example, filaments having a count of 2 dtex had been produced, it would have been possible to increase the polymer delivery to 0.8 g/hole/minute.

CLAIMS

1. Installation for making a nonwoven textile web comprising:

- 5 - at least one extruder (1) for a melted organic polymer feeding a spinneret (2) for producing a curtain of filaments (3);
- 10 - a cooling zone (4) for bringing about at least surface solidification of the said extruded filaments;
- 15 - a suction device (5) in the form of a narrow chamber of rectangular cross-section, inside which the curtain of filaments is subjected to the action of high-speed air streams causing the said filaments to be drawn;
- means (6) for deflecting and slowing down the air flow at the outlet of the drawing slot and for distributing the filaments homogeneously over a receiving belt (7);
- 20 characterised in that the means for carrying out the different operational phases, namely extruding means, cooling means, filament-drawing assembly and distributing means, are separate from one another and can be independently adjusted, not only according to the
- 25 production to be achieved (nature of the polymers, elementary count of the filaments produced, weight per unit area of the web produced), but also during the start-up phase of the production.

- 30 2. Installation according to Claim 1, characterised in that the cooling zone (3) at the spinneret outlet and the filament-drawing zone (5) consist of a plurality of elementary modules placed side by side according to the production width, the filament-opening system consisting,
- 35 for its part, of an assembly extending over the entire width of the web produced.

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3. Installation according to one of Claims 1 and 2, characterised in that the cooling at the spinneret (2) outlet is brought about by means of an assembly (4) having a plurality of successive zones (4a,4b,4c) for subjecting the curtain of filaments to a transverse air current, the speed and temperature of which may be adjusted independently in each of the zones.

4. Installation according to one of Claims 1 to 3, characterised in that the filament-drawing device (5) has a suction slot (F), the width of which may be adjusted automatically according to the production of the machine.

5. Installation according to one of Claims 1 to 4, characterised in that the filament-opening system (6), which is spaced from the outlet of the drawing system, consists of an assembly which laterally deflects the air flow, reducing the speed thereof and that of the filaments, and facilitating the uniform deposition on the conveyor (7) by eliminating any rebound at the moment of this deposition.

6. Installation according to Claim 5, characterised in that the filament-opening system (6) is associated with an assembly which electrostatically charges the said filaments before deposition on the receiving belt.

7. Installation according to one of Claims 1 to 6, characterised in that it has means for controlling, by computer, all of the subassemblies making it possible to bring about the increase in speed of the production line automatically.

8. Method for using an installation according to one of Claims 1 to 7, characterised in that:

- during the start-up phase, the temperature of the air inside each cooling zone (4a,4b,4c) decreases from one

zone to the next, it being possible for the speed of the traversing air in each zone to be adjusted and to be between 0.5 m/second and 3 m/second in each of the said zones, the drawing slot being maintained in the separated position,

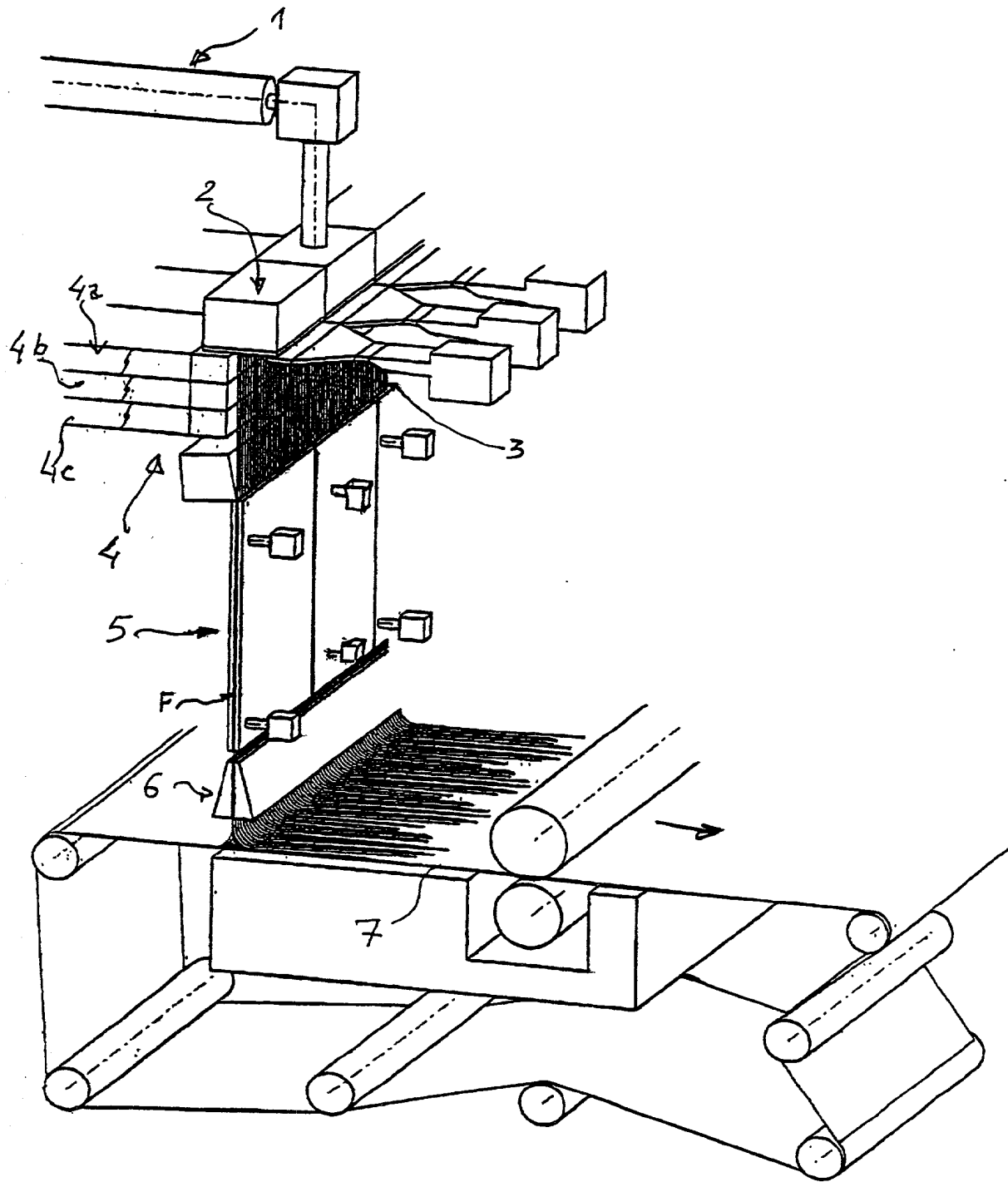
- the production speed is then increased progressively, the parameters of the zone (4) for cooling and heating up the filaments being modified in order to:

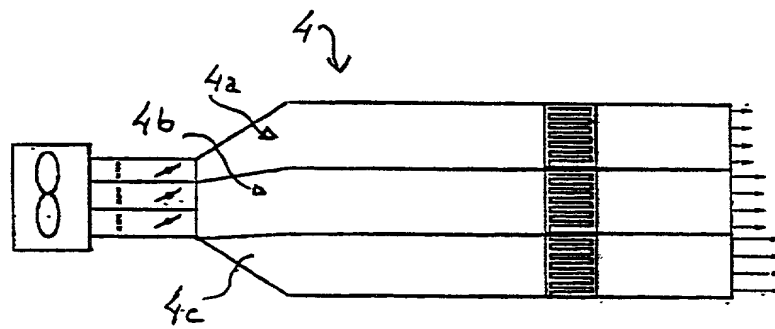
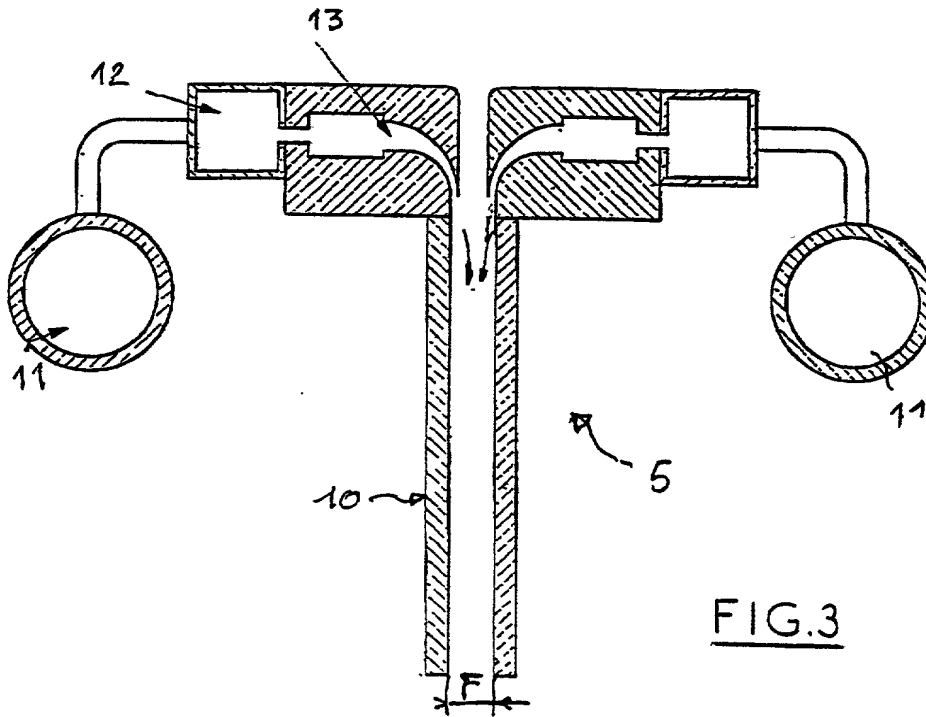
- . increase the air speed in the first zone (4a), the temperature remaining unchanged,
 - . increase the temperature in the second zone (4b) to bring it to the level of that of the first zone and increase the air speed in this zone,
 - . increase the air temperature in the third zone (4c) and increase the air speed in this zone;
- simultaneously, the width of the drawing slot is progressively reduced to attain a nominal operating value, the pressure of the drawing air being progressively increased.

Abstract

INSTALLATION FOR MAKING A NONWOVEN TEXTILE WEB AND METHOD
FOR USING SUCH AN INSTALLATION

The invention concerns an installation comprising at least an extruder for melted organic polymer feeding a die for producing a curtain of filaments; a cooling zone for providing at least surface solidification of said extruded filaments; a suction device in the form of a narrow chamber with rectangular cross-section, wherein the curtain of filaments is subjected to the action of high speed air streams causing the filaments to be drawn; means for deflecting and slowing down the air flow at the outlet of the drawing slot and for distributing the filaments homogeneously on a receiving belt. The invention is characterised in that the means for producing the different operational phases, namely the extruding means, the cooling means, the filament drawing assembly and the distributing means, are separate from one another and can be individually adjusted, not only based on the production to be obtained (type of polymers, elementary yarn count of filaments produced, weight per unit area of the web produced), but also at the beginning of production.

FIG.1



**COMBINED DECLARATION AND POWER OF ATTORNEY
IN ORIGINAL APPLICATION
(Sole or Joint - Foreign)**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:
Installation for making a nonwoven textile web and method for using such an installation.

the specification of which

_____ is attached hereto.
☒ was filed on April 20, 2000 as PCTInternational application Serial No. PCT/FR00/01049 and was amended on _____.

I hereby state that I have reviewed and understand the content of the above-identified specification, including the claims (Pearne, Gordon, McCoy & Granger Docket No. _____), as amended by any amendment referred to above. I acknowledge my duty to disclose information of which I am aware which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119, of any foreign application(s) for patent or inventor's certificate listed below, and have also identified below any foreign applications for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

| Country | Application Number | Filing Date (day/month/year) | Priority Claimed? | |
|---------|--------------------|------------------------------|-------------------|----|
| | | | Yes | No |
| FRANCE | 99 05401 | 23/04/1999 | X | |

I hereby designate the following as my mailing address and telephone number:

2005210 "EST 6007"

Pearne, Gordon, McCoy & Granger
1200 Leader Building
Cleveland, Ohio 44114
(216) 579-1700
(Control No. 000116)

and appoint each of the following as my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Charles B. Gordon, Reg. No. 16923
William C. McCoy, Reg. No. 16885
Richard H. Dickinson, Jr., Reg. No. 18622
Thomas P. Schiller, Reg. No. 20677
David B. Deidoma, Reg. No. 22841
Joseph J. Corso, Reg. No. 25845
Howard G. Shimola, Reg. No. 26232

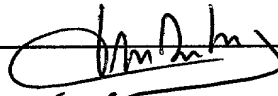
Jeffrey J. Sopko, Reg. No. 27676
John P. Murtaugh, Reg. No. 34226
James M. Moore, Reg. No. 32923
David E. Spaw, Reg. No. 34732
Michael W. Garvey, Reg. No. 35878
Paul R. Katterle, Reg. No. 36563
Richard M. Mescher, Reg. No. 38242

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

(1) Inventor (~~sole or~~ joint):

Citizenship: French

Signature



JEAN-MICHEL DUBUS

Date

29/10/01

Residence: NANTES EN RATIER (France)

FRX

Post Office Address: Le Freynet - 38350 Nantes en Ratier (France)

(2) Inventor (joint):

Citizenship: Italian

Signature

Domenico D'Amico

Date

29/10/01

Residence: ROVERETO (Italy)

ITX

Post Office Address: Via Zotti 61/a - 38068 ROVERETO(TN) - Italy

(3) Inventor (joint):

Citizenship: Italian

Signature

Rosario Mello

Date

29/10/01

Residence: VARESE (Italy)

ITX

Post Office Address: Via Sanvito 79- 21100 VARESE (Italy)

(4) Inventor (joint):

Citizenship:

Signature

Date

Residence:

Post Office Address: